REMARKS

The present patent application has been reviewed in light of the final Office Action dated July 1, 2008 and the Advisory Action dated November 10, 2008. The application now comprises fifty-five (55) claims, numbered 1 to 3, 7 to 9, 12 to 14, 20 to 22, 28 to 34, 37, 39, 40, 44, 45, 49, 50, 58, 61 and 64 to 90.

Claims 1, 20, 21, 22, 32, 39, 40, 44, 45, 49 and 50 have been amended to clarify the subject matter being claimed. New claims 65 to 90 have been added. Claims 4, 5, 10, 11, 15, 17 to 19, 23 to 27, 35, 36, 53 to 55, 57, 60 and 63 have been cancelled without prejudice or disclaimer of subject matter. Claims 16, 38, 41 to 43, 46 to 48, 51, 52, 56, 59 and 62 have been previously cancelled. Claims 12 to 14 stand as withdrawn. Claims 1, 22, 32, and 79 are independent.

Support for the amendments can be found throughout the patent application (including the specification and the drawings) as filed, including, for example, page 16, lines 1 to 6, page 18, line 7 to page 19, line 10, and Figure 8B. For new dependent claims 67 to 70, 74 to 77 and 84 to 87, support can be found at page 17, lines 25 to 30 and page 23, line 18 to page 25, line 20 (noting that, in one example, each of the Bragg gratings had a length of 21 mm and the longitudinal shift between the refractive index modulations of the gratings was 2 mm giving a ratio of 21/2 = 10.5, while in another example, each of the Bragg gratings had a length of 42 mm and the longitudinal shift between the refractive index modulations of the gratings was 2 mm giving a ratio of 42/2 = 21.0; and noting that, in one example, each Bragg grating had a length of 21 mm and 8 laser wavelengths were obtained giving a ratio of 3.8 laser wavelengths per cm of length of Bragg grating, while in another example, each Bragg grating had a length of 42 mm and 15 laser wavelengths were obtained giving a ratio of 3.6 laser wavelengths per cm of length of Bragg grating). For new dependent claims 71, 78 and 88, support can be found at page 23, line 13 and 14.

It is believed that no new matter has been added to the present patent application by the present response.

1. Rejection of Claims 1 to 3, 6 to 9, 15, 17 to 20, 22, 28 to 34, 37, 39, 40, 44, 45, 49, 50, 53 to 55, 58, 60, 61 and 63 under 35 USC 102 or 103

On pages 2 to 5 of the Final Office Action, the Examiner rejects claims 1 to 3, 6 to 9, 15, 17 to 20, 22, 28 to 34, 37, 50, 60 and 63 under 35 USC 102(b) as being anticipated by or alternatively under 35 USC 103(a) as being obvious over U.S. Patent 5,910,962 to Pan *et al.* (hereinafter referred to as "REF1") in view of "Dual wavelength modelocked fiber laser" by Town *et al.* (hereinafter referred to as "REF2") and "Wide-band Fabry-Perot-like filters in optical fiber" by Town *et al.* (hereinafter referred to as "REF3"). In addition, on pages 5 and 6 of the Final Office Action, the Examiner rejects claims 39, 40, 44, 45, 49, 50, 53 to 55, 58, 61 and 63 under 35 USC 103(a) as being unpatentable over REF1 and REF2.

As discussed below, the Applicants respectfully submit that claims 1 to 3, 7 to 9, 15, 22, 28 to 34, 37, 39, 40, 44, 45, 49, 50, 58 and 61 are allowable over REF1, REF2 and REF3.

Claims 1, 22 and 32 are reproduced below with certain features being emphasized:

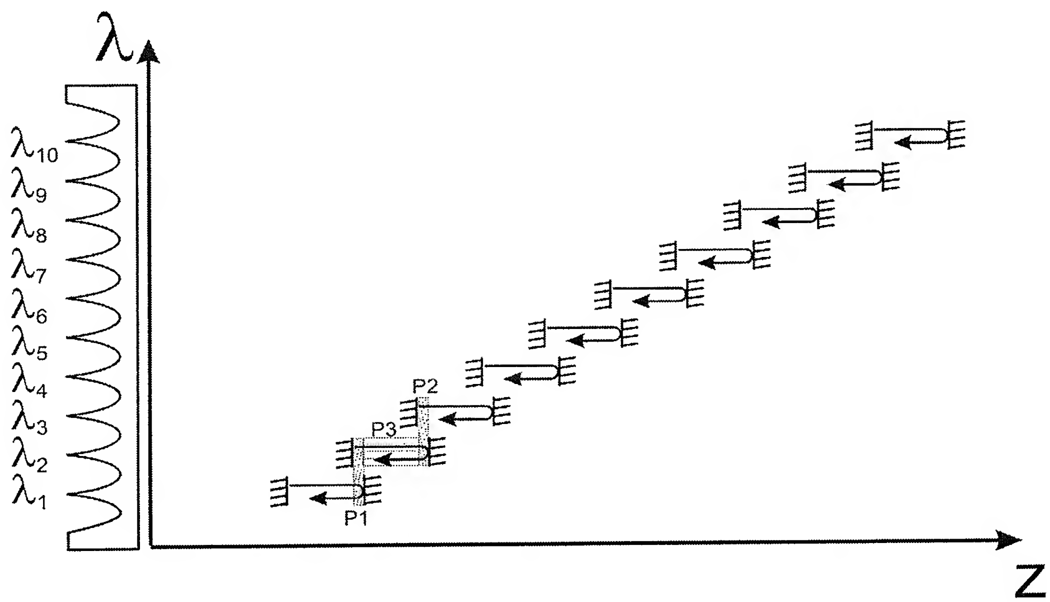
1. A multi-wavelength laser source comprising:
   a) an input for receiving an energy signal;
   b) a gain section in communication with said input, said gain section including a homogeneously broadened gain medium comprising rare-earth doped fiber having a superstructure grating, said superstructure grating comprising a first grating segment and a second grating segment superposed at least in part on said first grating segment to form at least three cavities, **each of said cavities occupying a portion of said doped fiber that is unoccupied by any other one of said cavities** such that, when the energy signal is applied to said gain section;
      - **different laser wavelengths resonate in respective ones of said cavities**; and
      - said gain section generates a multi-wavelength laser signal exhibiting the laser wavelengths; and
   c) an output for emitting the multi-wavelength laser signal.

22. A method for generating a multi-wavelength laser signal, said method comprising:
    a) receiving an energy signal;
    b) providing a gain section including a homogeneously broadened gain medium comprising rare-earth doped fiber having a superstructure grating, said superstructure grating comprising a first grating segment and a second grating segment superposed at least in part on said first grating segment to form at least three cavities, **each of said cavities occupying a portion of said doped fiber that is unoccupied by any other one of said cavities** such that, when the energy signal is applied to said gain section, **different laser wavelengths resonate in respective ones of said cavities**; and
    c) applying the energy signal to said gain section to generate a multi-wavelength laser signal exhibiting the laser wavelengths.

32. A multi-wavelength laser source comprising:
    a) a pump laser unit adapted for generating an energy signal;
    b) a gain section including a homogeneously broadened gain medium comprising rare-earth doped fiber having a superstructure grating, said superstructure grating comprising a first grating segment and a second grating segment superposed at least in part on said first grating segment to form at least three cavities, **each of said cavities occupying a portion of said doped fiber that is unoccupied by any other one of said cavities** such that, when the energy signal is applied to said gain section;
        - **different laser wavelengths resonate in respective ones of said cavities**; and
        - said gain section generates a multi-wavelength laser signal exhibiting the laser wavelengths; and
    c) an output for emitting the multi-wavelength laser signal.

These claims recite doped fiber having a superstructure grating that includes grating segments which are at least partially superposed to form **at least three cavities each occupying a respective portion of the fiber that is unoccupied by any other one of the cavities** such that, when an energy signal is applied, **different laser wavelengths resonate in respective ones of the cavities**.

An example of such cavities is shown in Figure 8B of the present patent application, which is partially reproduced below with certain annotations:



As can be seen, in this example, there are ten cavities and each cavity occupies a respective portion of the fiber that is unoccupied by any other one of the cavities such that, when an energy signal is applied, different laser wavelengths λ_1 to λ_{10} resonate in respective ones of the cavities. For example, the cavity in which wavelength λ_2 resonates occupies a portion P_3 (in horizontal hatching) of the fiber that is unoccupied by any other one of the cavities (in this example, the cavity in which wavelength λ_2 resonates occupies two other portions P_1 and P_2 (in diagonal hatching) of the fiber that are also respectively occupied by the cavities in which wavelengths λ_1 and λ_3 resonate). In other words, the portion P_3 of the fiber is unique to the cavity in which wavelength λ_2 resonates.

It is respectfully submitted that REF1, REF2 and REF3, whether considered either separately or in any permissible combination (if any) neither disclose nor render obvious doped fiber having a superstructure grating that includes grating segments which are at least partially superposed to form **at least three cavities each occupying a respective portion of the fiber that is unoccupied by any other one of the cavities** such that, when an energy signal is applied, **different laser wavelengths resonate in respective ones of the cavities**.

a) REF1

REF1 discloses a multiple wavelength laser source comprising a plurality of distributed Bragg reflector (DBR) or distributed feedback (DFB) fiber lasers 22A-22D each of which is formed by a pair of Bragg gratings 12, 13 that define a lasing cavity therebetween (col. 2, lines 28 to 34; col. 4, lines 26 to 39; and Figs. 1A and 3A). It is clear that the two Bragg gratings 12, 13 forming any lasing cavity in REF1 are spaced apart from one another. This spacing of two Bragg gratings 12, 13 is necessary in REF1 to provide a lasing cavity in which a wavelength can resonate. Therefore, REF1 neither discloses nor suggests **a first grating segment and a second grating segment superposed at least in part on the first grating segment.**

Since it neither discloses nor suggests a first grating segment and a second grating segment superposed at least in part on the first grating segment, REF1 cannot possibly disclose or suggest such *inexistent* first and second grating segments forming **at least three cavities each occupying a respective portion of the fiber that is unoccupied by any other one of the cavities** such that, when an energy signal is applied, **different laser wavelengths resonate in respective ones of the cavities**.

b) REF2 & REF3

REF2 discloses a modelocked fiber laser comprising a comb filter made by two overwritten chirped gratings. The two overwritten chirped gratings of the comb filter <u>do not form any cavity in which resonates a laser wavelength</u>. Rather, in REF2, there is only one laser cavity and it is formed by the entire optical loop shown in Fig. 1, including the erbium-doped fiber amplifier (EDFA), the chirped grating on each side of the EDFA, and the comb filter (p. 1459, 2nd col., 1st parag., line 1). The comb filter is a passive filter that is contained within the laser cavity to allow passage of specific wavelengths, but does not itself form any cavity in which resonates a laser wavelength.

The two overwritten chirped gratings of REF2's comb filter, which are fabricated as discussed in REF3, do not form three or more cavities each occupying a respective portion of the fiber that is unoccupied by any other one of these cavities.

Under 37 CFR §1.132, a declaration of Dr. Peter Krug, Senior Scientist in the Advanced Photonic Components Group at the Department of Electronics of Carleton University in Ottawa, Ontario, Canada, is submitted herewith.

As indicated in paragraphs 7 and 8 of Dr. Krug's declaration, the cavities formed by the two overwritten chirped gratings of REF3 overlap so much that every cavity, except the first and last cavities, does not occupy a portion of the fiber that is unoccupied by any other one of the cavities. Rather, any portion of the fiber occupied by any cavity, except the first and last cavities, is also occupied by a portion of the fiber that is occupied by another cavity.

Therefore, fabricating the two overwritten chirped gratings of REF2 (as discussed in REF3) on a doped optical fiber would not form at least three cavities each occupying a respective portion of the fiber that is unoccupied by any other one of the cavities such that, when an energy signal is applied, different laser wavelengths resonate in respective ones of the cavities.

As indicated in paragraph 9 of Dr. Krug's declaration, it would not have been obvious to fabricate two overwritten chirped gratings as in REF2 or REF3 on a doped optical fiber such that they form at least three cavities each occupying a respective portion of the fiber that is unoccupied by any other one of the cavities such that, when an energy signal is applied, different laser wavelengths resonate in respective ones of the cavities. Firstly, nothing in REF2 or REF3 would lead one to contemplate designing the two overwritten chirped gratings to ensure that they form such three or more cavities, let alone to establish how the chirp of these gratings would have to be selected to do this. Secondly, in both REF2 and REF3, the two overwritten chirped gratings are located on a passive portion of the fiber (i.e., a portion that is not doped to form a gain medium) and there would be no apparent reason to contemplate fabricating such overwritten chirped gratings on an active portion of an optical fiber.

Accordingly, REF2 and REF3 neither disclose nor render obvious doped fiber having a superstructure grating that includes grating segments which are at least partially superposed to form **at least three cavities each occupying a respective portion of the fiber that is unoccupied by any other one of the cavities** such that, when an energy signal is applied, **different laser wavelengths resonate in respective ones of the cavities**.

c) REF1 with REF2 & REF3

As indicated in paragraph 10 of Dr. Krug's declaration, it would not have been obvious to incorporate the two overwritten chirped gratings of REF2 (fabricated as discussed in REF3) into the laser source of REF1 to form at least three cavities each occupying a respective portion of the fiber that is unoccupied by any other one of the cavities such that, when an energy signal is applied, different laser wavelengths resonate in respective ones of the cavities. In fact, in the unlikely event that one were to replace each pair of Bragg gratings forming a respective one of REF1's fiber lasers 22A-22D by a respective pair of overwritten chirped gratings from REF2, every pair of overwritten chirped gratings in the resulting laser source would form cavities which (as discussed above) overlap so much that any portion of the fiber occupied by any cavity, except the first and last cavities, is also occupied by a portion of the fiber that is occupied by another cavity. Thus, every pair of overwritten chirped gratings in the resulting laser source would not form at least three cavities each occupying a respective portion of the fiber that is unoccupied by any other one of the cavities such that, when an energy signal is applied, different laser wavelengths resonate in respective ones of the cavities. This would cause high gain competition and thus discourage multi-wavelength lasing action.

In view of the foregoing, it is apparent that REF1, REF2 and REF3, taken separately or in combination, fail to anticipate or render obvious each of claims 1, 22 and 32. The Examiner is therefore respectfully requested to withdraw the rejection of claims 1, 22 and 32, which are believed to be allowable.

Each of dependent claims 2, 3, 7 to 9, 28 to 31, 33, 34, 37, 39, 40, 44, 45, 49, 50, 58 and 61 depends on one of claims 1, 22 and 32 and thus incorporates by reference all the features of its base claim. As such, the Examiner is respectfully requested to withdraw the rejection of these dependent claims, which are believed to be allowable.

2. Rejection of Claim 21 under 35 USC 103

On page 6 of the Final Office Action, the Examiner rejects claim 21 under 35 USC 103(a) as being unpatentable over REF1 and REF2 and further in view of U.S. Patent Application Publication 2004/0037505 by Morin *et al.* (hereinafter referred to as "Morin"). According to the Examiner, Morin discloses writing a superstructure grating in a waveguide cladding.

Dependent claim 21 depends on claim 1 and thus incorporates by reference all the features of this base claim. If Moring adds nothing more than the teaching of writing a superstructure grating in a waveguide cladding, then it follows that Morin fails to overcome the deficiencies of REF1 and REF2, as discussed above in section 1.

Therefore, the Examiner is respectfully requested to withdraw the rejection of claim 21, which is believed to be allowable.

3. Patentability of New Claims 65 to 78

Each of new dependent claims 65 to 78 depends on one of claims 1 and 22 and thus incorporates by reference all the features of its base claim. In addition to being allowable in view of their dependency on claim 1 or 22, new dependent claims 65 to 78 recite additional features which further distinguish from the cited art. Accordingly, new dependent claims 65 to 78 are believed to be allowable.

4. Patentability of New Claims 79 to 90

New independent claim 79 is reproduced below with certain features being emphasized:

79. A multi-wavelength laser source comprising:
    a) an input for receiving an energy signal;
    b) a gain section in communication with said input, said gain section including a homogeneously broadened gain medium comprising rare-earth doped fiber having **a superstructure grating**, said superstructure grating forming **at least three cavities, each of said cavities occupying a portion of said doped fiber that is unoccupied by any other one of said cavities** such that, when the energy signal is applied to said gain section;
        - **different laser wavelengths resonate in respective ones of said cavities**; and
        - said gain section generates a multi-wavelength laser signal exhibiting the laser wavelengths; and
    c) an output for emitting the multi-wavelength laser signal.

On page 3 of the Final Office Action, the Examiner contends that "since no definition of superstructure grating is provided in the claim the gratings pairs disclosed in the Ref 1 can be considered to form superstructure grating".

With respect, the Applicants disagree and submit that the set of pairs of Bragg gratings forming REF1's fiber lasers 22A-22D would not be considered a "superstructure grating" by those ordinarily skilled in the art.

Specifically, as indicated in paragraph 5 of Dr. Krug's declaration, the expression "superstructure grating" is well-known and used by those ordinarily skilled in the art to refer to a grating structure fabricated with a modulated exposure over the length of the grating structure. One characteristic of such a grating structure is that there is a well-defined phase relationship between all the parts of the grating structure. The pairs of Bragg gratings in REF1 do not constitute a grating structure that is fabricated with a modulated exposure over the length of the grating structure. Rather, the sections of fiber between the Bragg gratings in REF1 have not been subject to any modulated exposure. Also, each pair of Bragg gratings in REF1 does not have (nor does it require) any particular phase relationship with other ones of the grating pairs. Therefore, the set of pairs of Bragg gratings in REF1 cannot be considered a "superstructure grating".

Since REF1 does not disclose a superstructure grating, and in view of REF2 and REF3's failure to disclose or render obvious at least three cavities each occupying a respective portion of a fiber that is unoccupied by any other one of the cavities (as discussed in section 1), it is clear that REF1, REF2 and REF3 neither disclose nor render obvious doped fiber having a **superstructure grating forming at least three cavities each occupying a respective portion of the fiber that is unoccupied by any other one of the cavities** such that, when an energy signal is applied, **different laser wavelengths resonate in respective ones of the cavities**.

Each of dependent claims 80 to 90 depends on claim 79 and thus incorporates by reference all the features of this base claim. As such, dependent claims 80 to 90 are believed to be allowable.

CONCLUSION

Claims 1 to 3, 7 to 9, 12 to 14, 20 to 22, 28 to 34, 37, 39, 40, 44, 45, 49, 50, 58, 61 and 64 to 90 are believed to be allowable. Favorable reconsideration is requested. In addition, rejoinder of withdrawn claims 12 to 14, which are also believed to be allowable, is respectfully requested upon allowance of the generic claims presently in the application. Allowance of the application is earnestly solicited.

If the claims of the application are not considered to be in full condition for allowance, for any reason, the Applicants respectfully request the constructive assistance and suggestions of the Examiner in drafting one or more acceptable claims pursuant to MPEP 707.07(j) or in making constructive suggestions pursuant to MPEP 706.03 so that the application can be placed in allowable condition as soon as possible and without the need for further proceedings.

Respectfully submitted,

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